



Types, Uses and Locations of Real-time Biological Monitoring in Europe and the United States



*Moldaenke, C., Kronshagen, Germany, Marten, M. Environmental Protection, Baden-Wuerttemberg Germany, Goodrich, J.A. and Lazorchak, J., U.S. EPA, Cincinnati, OH.

Abstract

Many different types of real-time biological monitoring (fish behavior and bioelectrical signals, daphnid behaviour toximeter, clam monitors, algal fluorescence change, and luminescent bacteria) have been used in several countries (Germany, Netherlands, France, England) and many locations in Europe. Only a few types of real-time biological monitoring systems (clam gape, fish ventilatory movement and daphnia behaviour toximeter and Algal fluorescence change) have been or are currently used at a few locations (Texas, Florida, Maryland, Tennessee, Ohio) in the United States. We will present the types of real-time biological monitors, their uses, brief descriptions of how they work and their locations in Europe and the United States.

Material and Methods

The map for Sites with biosensors in Europe was developed by M. Marten, Environmental Protection, Baden-Wuerttemberg Germany. The United States Map and sites were developed by James Lazorchak, U.S. EPA, Office of Research and Development, Cincinnati, Ohio. The source of U.S. locations came from two internet sources: ECOTOXICOLOGY-L@LISTSERV.VT.EDU And realtime_biomonitor@ecoplex.unt.edu and from contacts within EPA - i.e. Dr. Bernie Daniel provided information on Orange County, CA.

Biosensor Sites In Europe



**Orange County Water District
Off-River Fort Bay Recharge System
Orange County Co., CA,**

(Fish, algae, invertebrate) Medaka (*Oryzias latipes*), Blue Gill Sunfish (*Leopomis macrochirus*), and Zebrafish (*Brachydanio rerio*) in flow-through culture.

Purpose: Testing phase to detect possible toxic chemicals in ground waters (source water) used for drinking water in Orange Co. Orange Co. Ground water aquifers are recharged with Santa Ana River water having wastewater content.

Contact: Margaret W. Toussaint, Geo-Centers, 568 Doughten Drive, Fort Detrick, MD 21702-5010; and Greg D. Woodside, Orange County Water District, Ellis Avenue, Fountain Valley, CA 92708 (714)

Types and Locations of Real-time Biological Monitoring in Europe and the United States.

**Clam Monitor Lake Lewisville, TX
Research and Development/Public Education Since 2-3-2000
Clam Biomonitoring System University of North Texas
William T. Waller**

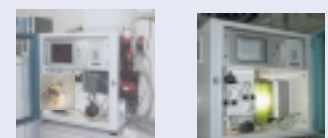


**Ohio - Miamiville - Clam Sensor -
Same System as Lake Lewisville**

**Contact Jim Lazorchak - USEPA
Office of Research and Development - Cincinnati
513 569 7076
Lazorchak.jim@epa.gov
Purpose: Ecological Monitoring**



**Ohio - Ohio River in Cincinnati
Daphnid and Algal Monitor
Purpose: Drinking Water Monitoring Applications Research
Contact Roy Haught - USEPA
Office of Research and Development
513 569 7067
haught.roy@epa.gov**



Daphnid Sensor

bbe Daphniatoximeter
Parameters: mobility and agility of daphnia
average velocity and distribution
fractal dimension (curviness) and angle
distance and groups
swimming height
Daphnia growth
Color: growing time index



Algal Sensor

Measurements:
→ Measurement of direct chlorophyll fluorescence:
This measurement corresponds to the wet-chemical chlorophyll analysis.
→ Measurement of living chlorophyll fluorescence of the water sample (Genty-method):
This measurement shows the percentage of active chlorophyll and serves as degree of toxicity.
→ Measurement of algae class distribution
This measurement gives a quantitative mass of different algae classes.
→ Measuring the transmission of the sample:
This measurement takes place automatically during each analysis in order to compensate the influence of substances which cause turbidity.
→ Measuring of Inhibition of Algae activity through a sample. Inhibition is calculated as relation between activity of algae in sample and activity of algae in reference water.



Fish Sensor

Types of Sensors:

Conclusions

- 1) It is obvious that the European Countries are ahead of the U.S. in the use of Real-time Biomonitoring.
- 2) The U.S. needs to accelerate the use of Biomonitoring for source water monitoring and drinking water distribution systems monitoring especially in light of recent terrorism activities,